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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/069,668	04/29/1998	KIE Y. AHN	303.466US1	3628

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SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402

EXAMINER	
COLEMAN, WILLIAM D	
ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 08/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/069,668	Applicant(s) AHN ET AL.	
	Examiner W. David Coleman	Art Unit 2823	

-- The MAILING DATE of this communication app ars on the cover sh et with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *August 6, 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30 and 32-38* is/are pending in the application.

4a) Of the above claim(s) *29 and 30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28 and 32-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Applicant's arguments filed August 6, 2002 have been fully considered but they are not persuasive.

2. FIRST, Applicants contend that it is an inaccurate reading of Tsai, U.S. Patent 5,235,204 in view of Wolf "Silicon Processing For The VLSI ERA", vol. 2 (Process Integration), Lattice Press, 1990, pp. 116-117 & 126-127, herein known as Tsai and Wolf. Specifically, Applicants contend that Wolf teaches away from the claimed invention because Wolf teaches diffusion or migration of silicon into aluminum. Applicant's further contend that ***IF*** one were to remove the sacrificial layer, silicon transport would still occur.

3. In response to Applicants contention that Wolf teaches away from Applicant's invention, Wolf is pertinent because Wolf is not removing the sacrificial layer. Electromigration is minimized from electron transport from the silicon substrate.

4. SECOND, Applicants contend that the motivation of Wolf is hindsight reasoning.

5. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392,

170 USPQ 209 (CCPA 1971). Please note that "interdiffusion" cited by Wolf is the equivalent of cross-diffusion.

6. THIRD, Applicants contend that the Examiner has taken Official Notice with the meaning of "cross diffusion".

7. In response to Applicants contention that the Examiner has taken Official Notice there is no statement of these assertion in the previous art rejections. Applicants have not provided neither paragraph nor page numbers where it can be reasonably cited that Official Notice was taken. Wolf was cited because "interdiffusion" is readily accepted and equivalent as cross-diffusion as argued by Applicants in paper no. 21, pp. 4 line 19 or third paragraph). It is clear that "interdiffusion" is defined from Webster's Collegiate Dictionary that the process of diffusing and mixing freely so as to approach a homogenous mixture.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1-28 and 32-39 recites the limitation "metal" in independent claims 1, 4, 6,12, 18, 20, 23 28, 32, 33 and 35. There is insufficient antecedent basis for this limitation in the claim. Correction is required. Prior to the amendment filed February 21, 2001, Applicants used the term "substituting metal for at least a portion of the polysilicon structure", which is clear and

there is no ambiguity. Applicant's amendment filed on or after February 21, 2001, Applicant's amended claim was changed to "cross-diffusing a metal for at least a polysilicon portion". The Examiner's position is that to cross-diffuse a metal for at least the polysilicon portion, a metal must be deposited or formed prior to cross-diffusion.

10. Applicants have not provided a reasonable disclosure to provide for such a process step, i.e., the metal must be provided before it can be cross-diffused. Applicants claim to substantially replace a portion of the polysilicon with aluminum and after cross-diffusing produce a metal emitter entirely above the surface of the substrate at the emitter region. Please not that there is a metal layer above the surface of the substrate at the emitter region position in the Tsai teachings. According to the conventional Laws of Physics, matter is neither created nor destroyed, however, Applicants are implying that cross-diffusing aluminum will substantially replace polysilicon. This would be reasonable if Applicant's provided a specific amount of polysilicon material and a specific amount of aluminum which would be more than the polysilicon layer and decided to form aluminum contacts alloyed with a small amount of silicon. However, as the interpreted by what is written in the claims and disclosed in the Application, Applicant does not have support for substantially substituting all of the polysilicon for aluminum as claimed.

11. Correction is required.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 28, 32, 33, 35, 36, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, U.S. Patent 5,235,204 in view of Wolf, "Silicon Processing For The VLSI ERA", vol. 2 (Process Integration), Lattice Press, 1990, pp. 116-117 & 126-127.

14. Pertaining to claims, 1, 4, 5, 7, 8, 9, 10, 28, 35, 36, 37, 38 and 39, Tsai discloses a semiconductor process substantially as claimed. See **FIG. 6**, where a method of making an emitter contact for an emitter region of a bipolar transistor is disclosed. Tsai discloses a polysilicon structure **60** over an emitter region position of a semiconductive substrate (not numbered). However, the metal emitter contact is not formed by cross diffusing the metal and a portion of the polysilicon structure. Wolf teaches the use of a doped polysilicon sacrificial barrier in the fabrication of contacts and interconnects (pp. 126). A thin layer of doped polysilicon can be used to separate the Al and the single-crystal Si substrate (Fig. 3-28). After the Al:Si alloy film as been patterned, the contact structure is annealed (pp.127). In view of Wolf, it would have been obvious to one of ordinary skill in the art to form the metal emitter contact of Tsai by cross diffusing the metal and a portion of the polysilicon structure, because this process alleviates the problem of junction spiking (pp. 116).

15. Pertaining to claim 2, Tsai discloses an emitter region **40** as seen in **FIG. 6**. However, in the absence of new or unexpected results, the mere reversal of the order of performing process steps has been held to be prima facie obvious. In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

16. Pertaining to claim 3, Tsai discloses that the emitter region 40 is polysilicon and

metallurgy level being aluminum, which is obviously a doped layer (p-type) that will outdiffuse into the polysilicon region when annealed.

17. Pertaining to claim 11, Tsai discloses that the metal layer 64, can be aluminum.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, U.S. Patent 5,235,204 in view of Wolf, "Silicon Processing For The VLSI ERA", vol. 2 (Process Integration), Lattice Press, 1990, pp. 116-117 & 126-127, as applied to claims 1-3 and 7-11 above, and further in view of Aboelfotoh et l., U.S. Patent 5,801,444.

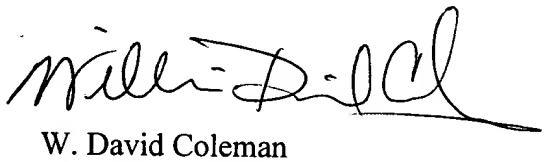
18. The combined teachings of Tsai in view of Wolf discloses a semiconductor process substantially as claimed as discussed above. However the combined teachings fail to disclose a polysilicon layer that includes polysilicon and germanium. Aboelfotoh discloses a semiconductor process wherein germanium is included with silicon for the purpose of making electrical contacts. See **FIG. 11** of Aboelfotoh, where germanium (**11**) is deposited with polysilicon for the purposes of a contact for a semiconductor device. In view of Aboelfotoh it would have been obvious to one of ordinary skill in the art to include germanium with polysilicon for contact formation because a substantial advantage to be gained is that electrically stable contact metallization (column 5, lines 49-51).

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



W. David Coleman
Examiner
Art Unit 2823

WDC
August 19, 2002